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**Purpose/Objective:** In the Stereotactic Body Radiation Treatment (SBRT) of lung tumors with 3-D planning, designing an Internal Target Volume (ITV) framing the Gross Tumor Volumes (GTV) in different phases of the respiratory cycle can be modified in each treatment fraction, even losing coverage dose if there is any change in the position of the tumor or in the patient breathing pattern.
Our objective was to analyze changes in the ITV between each fraction SBRT treatment and the dose and coverage achieved by this volume in each of the given fractions.
**Materials and Methods:** We analyze 20 patients and 22 treated lung lesions (primary/metastatic), aged from 57 to 84 years. Simulation and design of volumes were done with the fusion of three CT studies in different respiratory phases: normal breathing, inspiration, expiration. This procedure was done in each fraction of treatment. Immobilization devices were used for stereotactic conditions (vacuum mattres; prostep system). Three GTV were delineated and one ITV was designed to frame the boundaries of the three GTV. Margin of 5mm was added to the ITV for the Planning Target Volume (PTV). The first planned treatment (*ITV_0_planning*) was applied in every new volume designed in each fraction and modified if necessary, resulting one ITV for each fraction (ITV_1; ITV_2,…). SBRT treatment was delivered with linear accelerator CLINAC 2100 (Varian). 3D planning was performed with Pinnacle System software (Phillips). For the ITV coverage analysis and dosimetry we selected the 100% of the total prescribed dose. Conformal Index ranged between 1.2-3.5.
**Results:** The numbers of fractions administered: 1 fraction in two cases; 2 fractions in eight cases; 3 fractions in 12 cases. Maximum interfraction interval time was 48 hours, and minimum 24 hours.
ITV volume interfraction variation: (fig. 1)
Mean: 3,9cc; median: 2,6cc; min: 0,5; max: 16.7
The relative variation to the *ITV_0_planning* volume:
Mean: 26%; median: 22.5%; min: 2%; max: 68%
ITV coverage (total prescribed dose) interfraction variation: (fig. 2)
Mean: 5,3%; median: 2%; min: 0; max 2,5%
In five cases (22.7%) the ITV coverage variation was ≥ 10%.

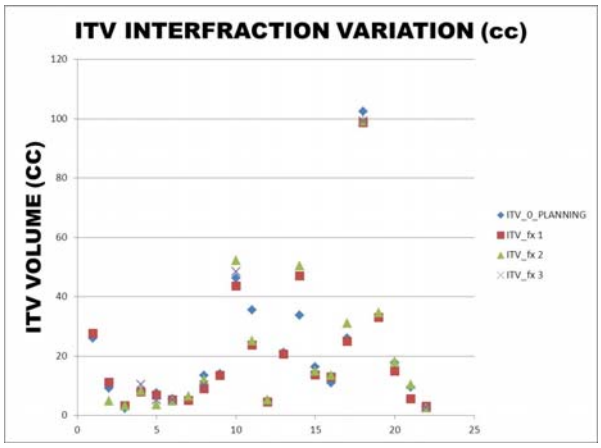

Fig. 1. ITV interfraction variation (vol. cc)

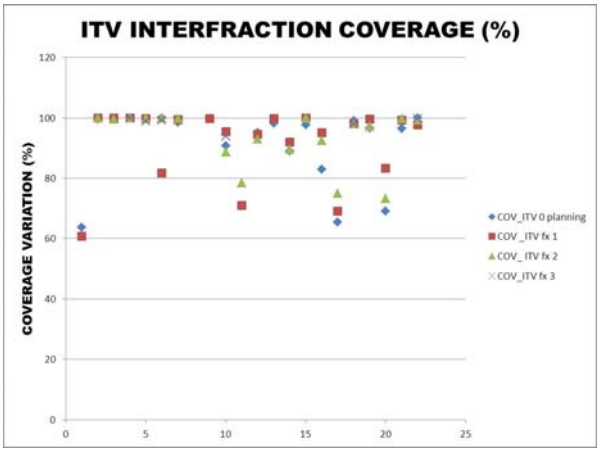

Fig. 2. ITV interfraction coverage

**Conclusions:** There is a variation in the interfracción ITV in SBRT treatments. The percentage change in this volume regarding designed for treatment planning reaches an average of 26% of the initial volume ITV. Dosimetry from the initial planning (not modified for the new ITV´s) yielded a mean variation in the ITV interfraction coverage of 5.3%, which seems not excessive. In 78% of cases, the ITV coverage variation was within 90% of the total prescribed dose. In our practice, replanning despite variations ITV is not necessary, although there are cases where the total prescribed dose may fail to protect 100% of this volume. The Planning Target Volume (PTV) coverage and tolerance of organs at risk are those which define the need for change in the initial planning.

**EP-1163**

## Can concurrent chemoradiation be delayed by induction chemotherapy to treat stage III NSCLC? a pooled analysis

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**Purpose/Objective:** Standard treatment for inoperable stage 3 NSCLC is concurrent chemo-radiation (CRT). In busy centers such as ours, radiation treatment often cannot be started promptly. To prevent treatment delays, a regimen consisting of induction chemotherapy followed by CRT was developed. In the induction phase, carboplatin (C) and gemcitabine (G) are given. In the CRT phase, low-dose paclitaxel (P) and G were used for their known radio-sensitizing properties. This approach was initially tested in a phase II protocol between 2003 and 2004 and continues to be routinely used at the McGill University Health Centre (MUHC). We report the long term outcomes with this regimen based on a pooled analysis of both protocol and non-protocol patients.
**Materials and Methods:** Forty-one stage 3 NSCLC patients were treated on protocol between January 2003, and November 2004. The outcomes and toxicity data of an additional 101 stage 3 NSCLC patients treated off-protocol with the same regimen between December 2004 and August 2013 at the MUHC were retrieved, giving a total of 142

patients: 80 males, 62 females, median age 64 (35-83), stage 3A (83 pts) or 3B (59 pts). Patients received 2 cycles of C AUC=5 IV on day 1 and G 1000mg/m$^2$ IV on days 1 and 8 every 3 weeks x 2, followed on day 50 by CRT, 60Gy/30 over 6 weeks, concomitantly with P 50mg/m$^2$ IV and G 100mg/m$^2$ IV on days 1 and 8 every three weeks x 2 cycles.
**Results:** The median overall survival was 23 months. With a median follow-up of 54 months, the 3, 4 and 5 year overall survival was 37% (38 pts remaining), 27% (21 pts), and 23% (15 pts) respectively. The median and 5 year progression-free survival rates were 11 months and 21% respectively. Rates of acute grade ≥ 3 hematological, esophageal and respiratory toxicity were, respectively, 20%, 8% and 7%. Forty-eight patients received further lines of chemotherapy.
**Conclusions:** The results of the present analysis based on 142 stage 3 NSCLC patients treated with this novel induction chemotherapy approach affirm its favourable toxicity profile without apparent compromise in clinical outcomes. Indeed, although the development of this regimen was motivated by delays to prompt commencement of CRT, the observed outcomes do compare favourably with those associated with immediate concurrent CRT regimens.

**EP-1164**

**Infrastructure to integrate translational research into clinical decision making for patients with lung cancer**

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**Purpose/Objective:** Decision Support Systems, based on statistical prediction models, have the potential to change the way medicine is being practiced, but their application is currently hampered by the astonishing lack of impact studies. The main goal of this project aims to develop a scalable infrastructure to integrate translational research into the clinical decision making process in lung cancer.
**Materials and Methods:** To develop this infrastructure, it was decided to use an integration based on free software tools. Among them, the management system for clinical trials, OpenClinica, provides mechanisms for the definition of electronic records and collection of cancer information relevant to research studies, as well as offers techniques for managing and maintaining the data. Additionally, for achieving a clinical decision support, we incorporated tools that provide mechanisms for data mining processes. The architecture also integrates a software for biomedical informatics research: i2b2. Information from different data sources such as the information recorded from the electronic health records of OpenClinica was stored centrally in a data warehouse. Finally, a tool integrates the mechanisms for analysis and data mining. Two different approaches are used for this task: RapidMiner to implement the algorithms of data mining and data analysis; and the business rule definition in JBoss Guvnor for process modeling in relation to the oncology clinical guide. With these two tools clinicians can receive recommendations based on both clinical data and decisional algorithms defined by international treatment guidelines.
**Results:** The recruitment from January 1, 2013 until September 1, 2014 comprises the clinical data from 163 lung cancer patients treated with radio(chemo)therapy. Genetic data come from another operating system and includes genotypes at 3 single nucleotide polymorphisms of the HSPB1 gene which has been found to be associated survival after using the data mining tool. Finally, the dosimetric data are exported from radiotherapy treatment planning systems. Currently, we are integrating the information mentioned before with the clinical decision support algorithms based on international treatment guidelines.
**Conclusions:** The development of infrastructures based on the integration of systems able to interoperate between each other will favor the agile integration between the classical research and the clinical practice, allowing the customization of treatments.

**EP-1165**

**Technical advantages of dynamic tumor tracking in lung stereotactic body radiation therapy using a gimbaled linac**

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**Purpose/Objective:** In patients treated with lung stereotactic body radiation therapy (SBRT), dynamic tumor tracking technique (DTT) can potentially improve accuracy of treatment and allow reduction of dose to the surrounding organs at risk (OARs). In Vero4DRT, the DTT can be performed by using its unique gimbaled linac system. The purpose of this study is to assess the technical advantages of DTT in lung SBRT when compared to treatment without DTT (static SBRT planning) on the Vero4DRT platform.
**Materials and Methods:** Thirteen patients from our institution treated with lung SBRT with DTT by Vero4DRT between March 2013 and September 2014 were included in this study. All patients underwent the same planning process detailed below. For each patient, an SBRT plan without DTT was created using the same CT images and compared with the actual treatment plan. Prior to CT simulation, fiducial markers were inserted around the tumor via bronchoscopy. During CT simulation, a planning CT was first obtained in the expiratory phase using a respiratory gating system, followed by a 4D-CT scan. GTV was then delineated on the planning CT. For DTT SBRT, ITV was defined as GTV plus uncertainty of distances from the center of the GTV to the center of the fiducial markers calculated in all phases of 4D-CT. PTV (tPTV) was created by adding an individualized margin to account for uncertainties of 4D respiratory model and other mechanical errors. For static SBRT, ITV was the summation of GTV positions in all phases of 4D-CT, and the PTV (sPTV) was defined as ITV plus 5mm margin for set-up errors. The prescription dose was 50 Gy in 4 fractions (D95 prescription) to both tPTV and sPTV. To assess the technical advantage of DTT SBRT, the PTV volumes and V20 of the lung for both sets of plans were compared.
**Results:** The median tumor diameter and respiratory motion in all patients was 30mm (12-48mm) and 17mm (4-31mm) respectively. The mean volumes of tPTV and sPTV were 32.6ml and 49.8ml respectively, corresponding to an average reduction of 28.7 ± 8.0% ($p = 0.0003$) in the tPTV compared